Math 130-01, Spring 2020 — Information about the first test

The first test for this course will be given in class on Wednesday, February 12. The test will cover Chapter 2 and Section 3.1. From Section 2.1, the test will cover only the first part, dealing with differential calculus. You should be familiar with the epsilon-delta definition of the limit from Chapter 2, Section 5, but there will not be any problems on the test that ask you to calculate limits using that definition or to find a δ for a given ϵ.

The test will include some essay-type questions that ask you to define something, or discuss something, or explain something, or state a theorem, and so on. There might be a longer conceptual essay question at the end. Other than that, you can expect most of the questions to be similar to the types of problems that were assigned for homework.

The lab on Tuesday, February 11 will be mostly review for the test, and your work for the lab will not be collected. Sample solutions for the lab exercises will be available at the lab.

You will not need a calculator for the test. *A basic non-graphing calculator will be provided to you, and you will be permitted to use only the calculator that is provided. Scrap paper will also be provided. All you need is a pencil.*

Here are some terms and ideas that you should be familiar with for the test:

the idea of a limit of a function, $\lim_{x\to a} f(x)$

using a table of function values to find the limit of a function

limits and approximation

limits from left and right, $\lim_{x\to a^-} f(x)$ and $\lim_{x\to a^+} f(x)$

a limit exists if and only if the limits from left and right both exist and are equal

how a limit can fail to exist: $f(a)$ undefined, vertical asymptote, jump, etc.

finding limits from graphs

finding limits from formulas

finding limits of split functions

infinite limits: $\lim_{x\to a} f(x) = +\infty$ and $\lim_{x\to a} f(x) = -\infty$

a limit whose value is written as $+\infty$ or $-\infty$ does not exist

basic laws: $\lim_{x\to a} x = a$ and $\lim_{x\to a} c = c$ for a constant c

limit laws for the limit of a sum, difference, product, quotient, power, root

using limit laws to evaluate a limit

evaluating a limit by "plugging in" and why it works limits of the form $\frac{k}{0}$, when $k \neq 0$

using algebra to manipulate a formula before evaluating its limit

Squeeze Theorem, how to apply it, and an intuitive idea of why it is valid

continuity of a function $f(x)$ at a point $x = a$

continuity of a function on an interval (open or closed)

removable discontinuity, jump discontinuity, infinite discontinuity

determining where a function is continuous and discontinuous from a formula

determining where a function is continuous and discontinuous from a graph

determing continutity of split functions

Intermediate Value Theorem, how to apply it, and an intuitive idea of why it is valid

epsilon-delta definition of limit (statement and idea of what it means)

average velocity on a time interval $a \leq t \leq b$: $\dfrac{s(b) - s(a)}{b - a}$, where $s(t)$ gives position

the problem of finding velocity at a single moment of time

instantantaneous velocity at a point in time, as a limit of average velocities

secant lines and tangent lines

finding the slope of a secant line

the problem of finding the slope of a tangent lime

slope of the tangent line as a limit of slopes of secant lines

the definition of the derivative at a point: $f'(a) = \lim_{x \to a} \dfrac{f(x) - f(a)}{x - a}$

equivalent formula for the derivative: $f'(a) = \lim_{h \to 0} \dfrac{f(a + h) - f(a)}{h}$

how the derivative represents an instantaneous velocity

how the derivative represents the slope of a tangent line